United States Patent [19]

Garcia, Jr. et al.

[11] **Patent Number: 5,034,602**

[45] **Date of Patent: Jul. 23, 1991**

[54] **OPTICALLY ACTIVATED KEYBOARD FOR DIGITAL SYSTEM HAVING CHARACTER BACK LIGHTING**

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[21] Appl. No.: **384,183**

[22] Filed: **Jul. 21, 1989**

[51] **Int. Cl.**[5] **H03K 17/94**; G01D 5/34

[52] **U.S. Cl.** **250/227.22**; 250/229; 341/31; 341/23; 340/712

[58] **Field of Search** 250/229, 221, 227, 227.22, 250/227.21; 340/711, 712; 341/31, 23, 22

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,519,116	7/1970	Koehn	250/229
3,676,689	7/1972	Knepper, Sr.	250/229
3,856,127	12/1974	Halfon et al.	250/221
4,078,257	3/1978	Bagley	341/23
4,303,856	12/1981	Serras-Paulet	250/229
4,311,990	1/1982	Burke	250/221
4,387,367	6/1983	Fisher	250/221
4,441,001	4/1984	Miyano et al.	340/712
4,551,717	11/1985	Dreher	340/712
4,806,908	2/1989	Krupnik	340/712
4,836,636	6/1989	Obara et al.	250/229

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[57] **ABSTRACT**

An optically activated keyboard having key members, each with a key pad having illuminated symbols at the keypad surface and for contact with the finger of the operator. A plunger is secured to the key pad for operating a device to indicate which key has been depressed. In one embodiment of the present invention, the plunger is formed of light transmitting material to transmit light from the interior of the keyboard to the key pad. The key pad has a light transmissive portion with a symbol thereon which is illuminated by the light passing through the plunger to provide the desired illuminated symbol. As a second embodiment, the symbol can be disposed in the light conducting plunger or therebeneath whereby the light entering the transparent key pad is in the shape of the desired symbol in either a negative or a positive representation thereof to project the desired symbol from the key pad. As a third embodiment, light travelling in the optically activated keyboard wave guides is partially reflected into the transparent plunger by a beam splitter in the plunger end extending into the wave guide. As a fourth embodiment, the beam splitter of the third embodiment is a portion of the plunger and extends below the wave guide to a light source. As a fifth embodiment, a slot is provided between the light source and the plunger for receipt of a removable template containing the characters corresponding to the key configuration.

25 Claims, 4 Drawing Sheets